Candidate Name	Class	Register Number

CHANGKAT CHANGI SECONDARY SCHOOL

Mid Year Examination 2010

Subject	**:**	**Science (Physics)**
Paper No	**:**	**5116/02 / 5117/02**
Level	**:**	**Secondary 4 Express / Secondary 5 Normal Academic**
Date	**:**	**13th May 2010**
Duration	**:**	**1 hour 15 minutes**
Setter	**:**	**Mr Melvin Ng**

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, class and register number in the spaces at the top of this page.

Answer **all** questions in Section A and any **two** questions in Section B.
In calculations, you should show all the steps in your working, giving your answer at each stage.
Enter the numbers of the Section B questions you have answered in the grid below.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiners' Use	Marks
Section A	/ 45
Section B	
	/ 10
	/ 10
Total	/ 65
Expected Grade	Actual Grade
Parent's / Guardian's signature	

This Question Paper consists of **15** printed pages.

Section A [45 MARKS]

Answer **all** the questions in the space provided.

1. The velocity time graph for car A in a race is shown in Figure 1.

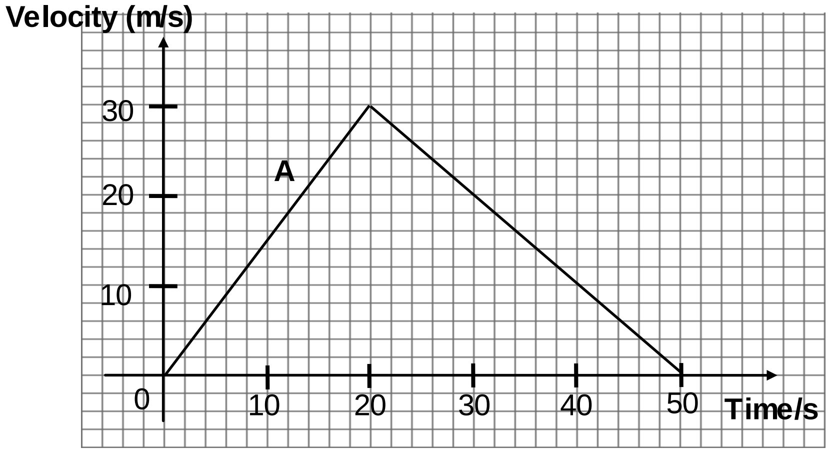

Figure 1

(a) Calculate the acceleration of car A before the brakes are applied. [2]

(b) Car B started at the same time as car A. It accelerates uniformly at a rate of 0.7 m/s^2 for 40s before it develops a fault and comes to a stop at 50s. [2]

Plot the graph of car B in Figure 1 above.

(c) When do cars A and B have the same velocity? [1]

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(d) Did car A and B travel the same distance in 50 s? Explain your answer with calculations. [2]

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2. Figure 4.1 shows an experiment in which a heating coil is used to warm a liquid **R** inside a container. A thermometer is placed in the container to record the changes in temperature.

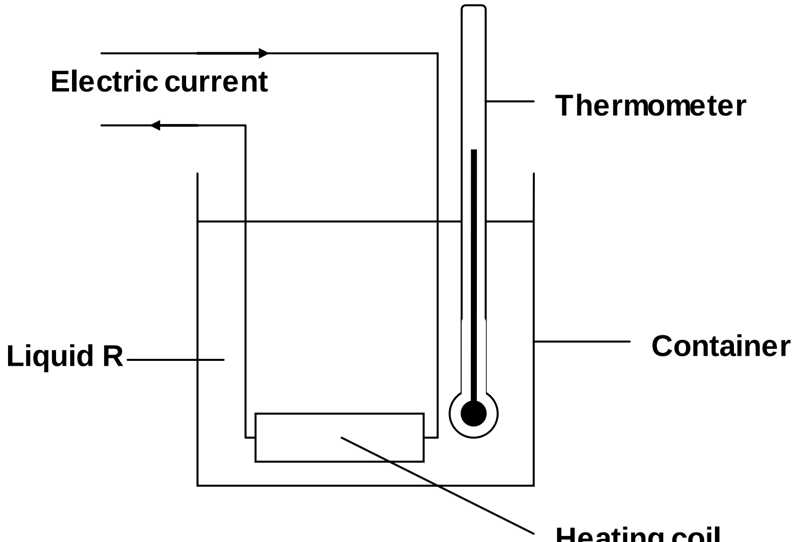

Figure 4.1

(a) Explain why the heating coil is placed at the bottom of the container. [2]

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(b) The temperature time graph of the liquid R is plotted as shown in Figure 4.2.

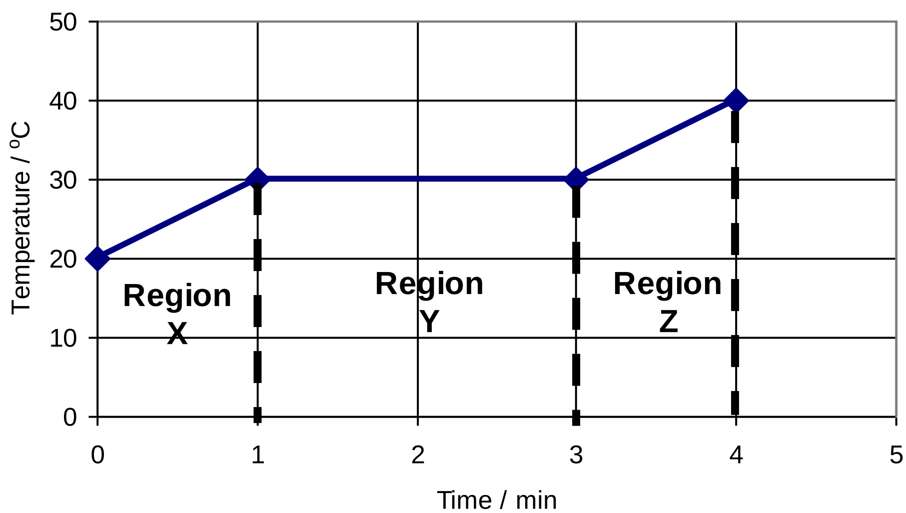

Figure 4.2

(i) Write down the states of liquid R in region **X, Y** and **Z** and use the kinetic model of matter to explain why there is no change in temperature in region **Y**. [3]

(c) In order to ensure all the heat supplied by the coil is mostly used to heat up the liquid R, a suitable material should be used for the container. State one such material and explain your choice. [2]

3. Electromagnetic waves have many uses.

(a) Information can be transmitted by light in optical fibres, in copper wires, or by microwaves.

(i) State and explain one advantage of using light in optical fibres to transmit information rather than using copper wires. [2]

(ii) Apart from the transmission of information, state one use of microwaves. [1]

(b) The ultra-violet region of the electromagnetic spectrum contains two sections, UVA and UVB. The wavelength range of UVA radiation is from 320nm to 400nm and the wavelength range of UVB radiation is from 280 nm to 320 nm.

(i) From the information given above, calculate the lowest frequency of the ultra-violet region. [2]

(ii) State one use of UV radiation. [1]

(iii) State the name of another region of the electromagnetic spectrum with a frequency higher than the ultra-violet region. [1]

4. A positively charged light ball is hung on an insulating thread as shown in Figure 6.1.

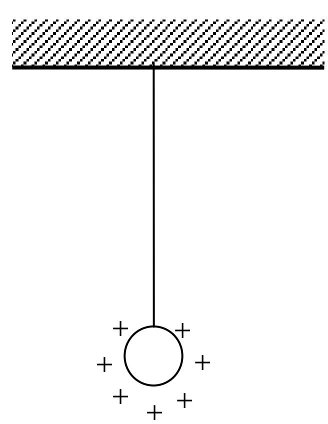

Figure 6.1

(a) A metal sphere S mounted on an insulating stand and connected to earth is then brought near to the ball. The following is observed in Figure 6.2.

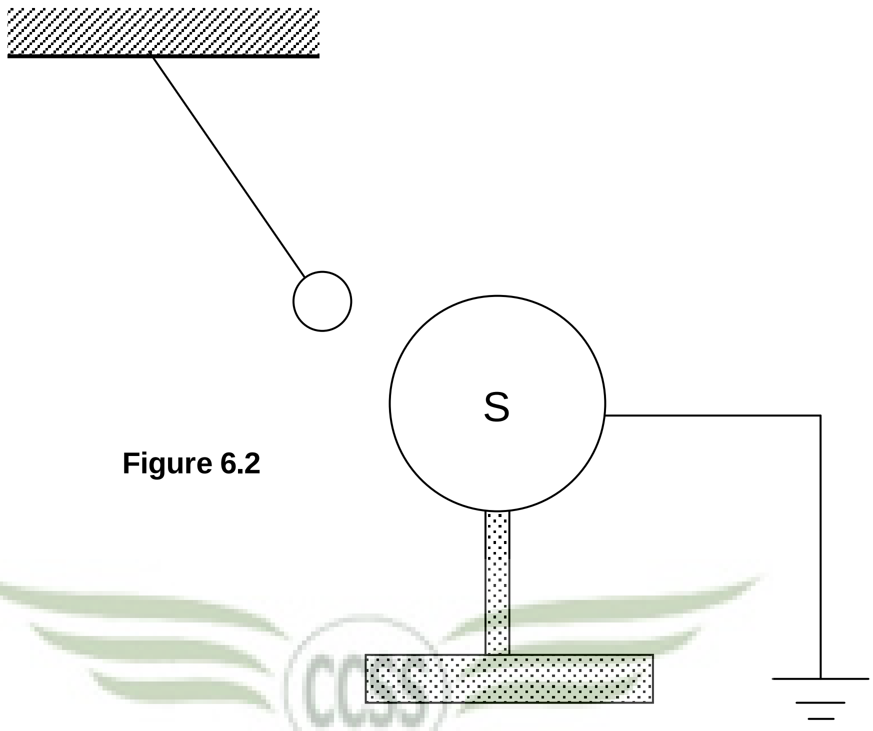

Figure 6.2

(i) Mark on the diagram, the charges on metal sphere S. [1]

(ii) Hence, explain why the light ball is deflected as shown in Figure 6.2. [2]

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(b) If a current of 0.02 A flows for 20 ms, calculate the charge that flows in the sphere S. State clearly the equation used in your calculation. [2]

5. Figure 7 below shows a circuit set-up.

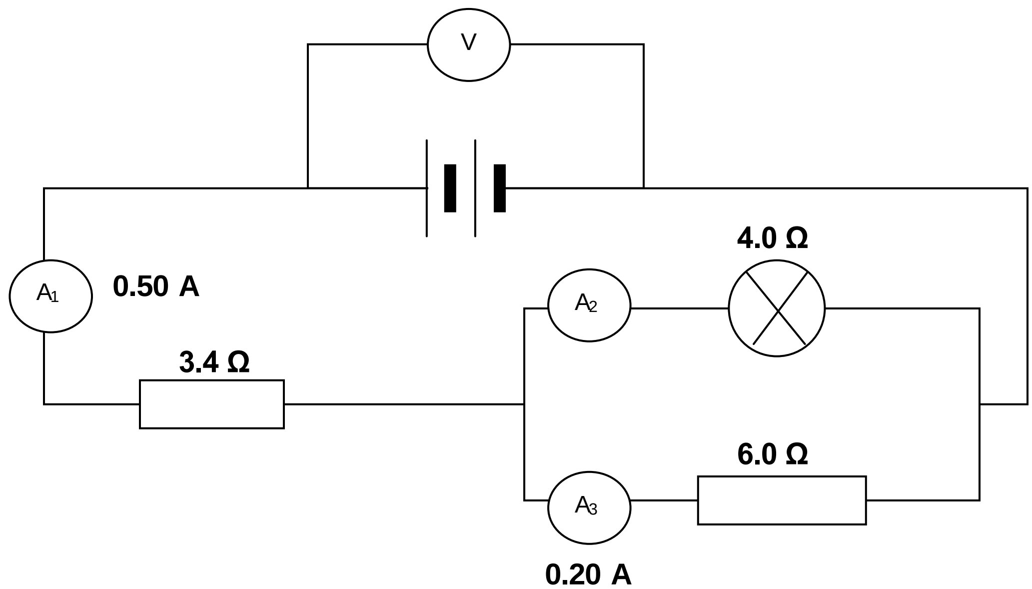

Figure 7

(a) Using the values shown, calculate

(i) the current through ammeter A_2 , [1]

(ii) the reading of the voltmeter across the dry cells, [2]

(iii) the energy dissipated in the 4.0 Ω lamp in 120 seconds. [2]

(b) In figure 7, indicate with a letter "X" where you would place another fixed resistor R to reduce the current flowing through the whole circuit. [1]

Section B [20 MARKS]

Answer any **two** questions from this section in the space provided.

6. **(a)** One way to measure the speed of sound in air is to position someone with a pistol, some distance from a second person who has a stopwatch. The stopwatch is started when the flash or smoke from the pistol is seen, and is stopped when the sound from the pistol is heard.

Explain how you would improve the reliability of the experiment given the following difficulties.

(i) There may be wind blowing during the experiment. (Assume wind speed is constant.) [2]

(ii) There may be error in starting or in stopping the stopwatch. [1]

(iii) The time interval being measured may be very short. [1]

(b) A sonar system sends pulses of ultrasound from the bottom of a ship. The reflected pulses are picked up by a receiver. The speed of the ultrasound in water is known to be 1600 m/s.

(i) If the frequency of ultrasound used by the sonar system is 40kHz, what is the wavelength of the ultrasound? [2]

(ii) If there is time of 0.1 s between a pulse being sent and received, what is the depth of the water below the ship? [2]

(iii) Explain why speed of ultrasound is greater in water than in air. [2]

7. An electric kettle heater is to be used on a 250 V mains supply. Figure 10 shows the arrangement of the heating elements in the heater. The resistors ***K***, ***L*** and ***M*** represent the heating elements. ***X***, ***Y*** and ***Z*** are switches that control which element is switched on.

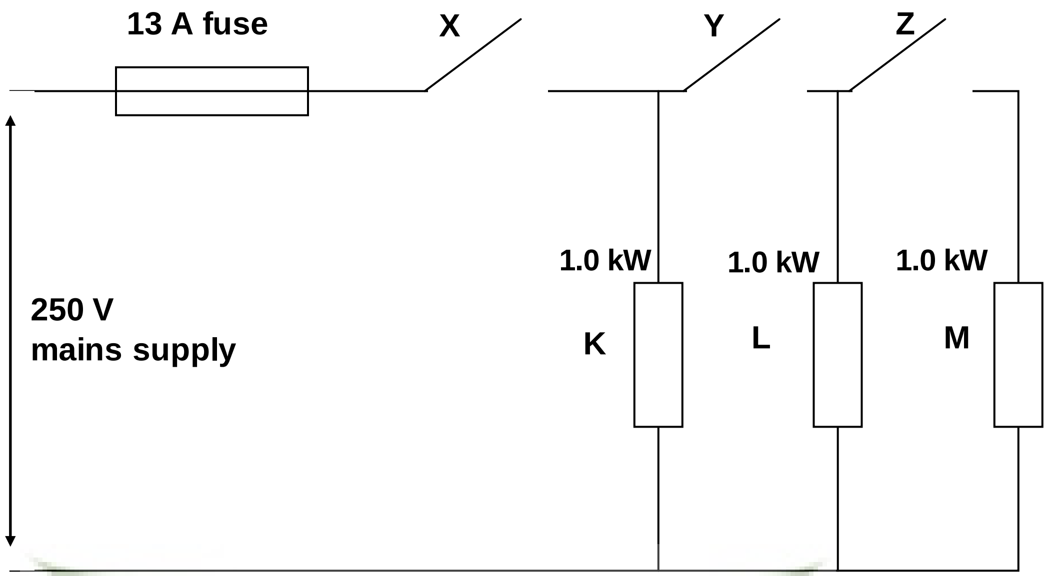

Figure 10

(a) If each element operates at a power of 1.0 kW when switched on, calculate the current in one of the heating elements. [2]

(b) The heater has a 13 A fuse fitted to it. Explain if this fuse is suitable for the heater. Show your calculations clearly. [1]

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(c) Calculate the amount of energy released by each element if the heater was switched on for 5 minutes. [2]

(d) If only 2 kW of power is required for heating, which set of switches should be closed? Explain your answer. [1]

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(e) If all the switches were closed and the kettle was switched on for 30 minutes, what is the energy supplied in kWh? [2]

(f) Using your answer in **(e),** calculate the cost of switching on the kettle for 30 minutes during a period of 8 days. Electrical energy is found to cost $0.30 cents per kWh. [1]

(g) When the heater is operating at 3 kW, will its overall resistance be greater or smaller than when it is operating at 1 kW? Explain your answer. [1]

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